

## ***Hibbertia striata*, a new combination for a long-overlooked Western Australian species, and inclusion of *H. pachyrrhiza* in *H. huegelii***

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### **Abstract**

Thiele, K.R. *Hibbertia striata*, a new combination for a long-overlooked Western Australian species, and inclusion of *H. pachyrrhiza* in *H. huegelii*. *Nuytsia* 28: 247–253 (2017). The common and widespread species *Hibbertia huegelii* (Endl.) F.Muell. comprises two distinct taxa, one of which matches the type of *Candollea striata* Steud., which is here recombined as *Hibbertia striata* (Steud.) K.R.Thiele. *Hibbertia pachyrrhiza* Steud. is reduced to a synonym of *H. huegelii* s. str. Descriptions and distribution maps are provided for both accepted species.

### **Introduction**

Field and herbarium observations aimed at resolving species boundaries between *Hibbertia huegelii* (Endl.) F.Muell., *H. pachyrrhiza* Steud. and related species have shown that two clearly distinct species are subsumed under the concept of *H. huegelii* as currently applied. One is characterised by leaves with acuminate apices and a distinct, narrow sulcus along the adaxial midline, and large flowers with consistently six stamens per bundle, the other by leaves with a more or less obtuse apex and lacking a distinct adaxial sulcus, and smaller flowers with usually four or five stamens per bundle. The two taxa match the types of *Candollea striata* Steud. and *C. huegelii* Endl. (= *H. huegelii* s. str.) respectively. They are both common, reasonably widespread and widely sympatric, and occur in intermixed stands at several locations in the Darling Range east of Perth where they are always distinct with no indication of intermediates. All specimens held at PERTH (as *H. huegelii* s. lat.) can be unambiguously assigned to one or other taxon.

*Candollea striata* was reduced by Bentham (1863) to a synonym of *C. huegelii*. When Mueller (1880) recombined all species of *Candollea* Labill. into *Hibbertia* Andrews, he followed Bentham's opinion regarding these species, and hence *C. striata* has no combination in *Hibbertia*. The *Australian Plant Census* (Council of Heads of Australasian Herbaria 2006–) currently lists *C. striata* as a name of uncertain application. Note that *Candollea striata* (Lindl.) F.Muell. (= *Sylidium striatum* Lindl.) is a later, invalid homonym.

*Hibbertia pachyrrhiza* was described at the same time as *C. striata*. Bentham (1863) combined *H. pachyrrhiza* into *Candollea*, remarking that it was '[n]early allied to *C. huegelii* [in his sense, i.e. including *C. striata*], and possibly a variety only', and describing it as having 'stems erect,

apparently arising from a thick rhizome, and more or less silky-hairy, as well as the leaves', with smaller flowers and fewer stamens per bundle. Wheeler (2004) followed Bentham in describing the leaves of *H. pachyrrhiza* as silky-hairy *cf.* glabrous in *H. huegelii*, and the flowers as being smaller (sepals 6–12 mm long *cf.* 10–17 mm respectively). In *Flora of the Perth Region* (Wheeler 1987), *H. pachyrrhiza* was described as having obtuse leaves *cf.* acute in *H. huegelii*, and Bentham's comments regarding the close similarity between the two species were noted, concluding that 'further studies are needed to clarify their relationships'. It is likely that *H. pachyrrhiza* was being compared with *C. striata* rather than *H. huegelii* s. str.

Field observations strongly indicate that *H. pachyrrhiza* comprises somewhat hairy individuals that in all other respects match *H. huegelii* s. str. Most specimens at PERTH comprise strong, upright new growth from the rootstock following fire, for this reason usually collected with part of the rootstock as described by Bentham (1863). Older plants form low, branching shrubs, specimens from which usually comprise a branch only. Specimens of *H. huegelii* s. str. (i.e. with *C. striata* removed) always have more or less hairy leaves, with the length and extent of indumentum variable. The obtuse leaves noted by Wheeler (1987) match those of *H. huegelii* s. str. The flower sizes of the PERTH specimens of *H. huegelii* s. str. and *H. pachyrrhiza* are also similar, again in contradistinction to *C. striata*, which usually has larger flowers. With specimens of *C. striata* removed, the distributions of *H. huegelii* s. str. and *H. pachyrrhiza* are almost entirely co-extensive. Finally, field visits to areas where *H. pachyrrhiza* has been collected yield abundant plants of *H. huegelii* s. str. exhibiting a continuous range in leaf indumentum.

This paper resolves the confusion surrounding these taxa by recombining *Candollea striata* into *Hibbertia* as *H. striata* (Steud.) K.R.Thiele, reducing *H. pachyrrhiza* to a synonym of *H. huegelii*, and recircumscribing *H. huegelii* to exclude specimens now referred to *H. striata*. Descriptions and distribution maps are provided for both accepted taxa.

## Taxonomy

***Hibbertia striata*** (Steud.) K.R.Thiele, *comb. nov.*

*Candollea striata* Steud., in J.G.C. Lehmann, *Pl. Preiss.* 1(2): 275 (1845), *non C. striata* (Lindl.) F.Muell., *Syst. Census Austral. Pl.* 86 (1882), *nom. illeg.*, *nom. superfl.* (= *Stylidium striatum* Lindl.). *Type*: 'In arenosis prope oppidulum Perth, 6 Jun. 1839. Herb. Preiss. No. 2148.' (*syn*: BR 13462604 image!, FI 10053 image!, HBG 507147 image!, LD 1811953 image!, M 212901 image!, MEL 666854!, 666855!, 666856!, 666857!, 666858!, 666859!, MO 279481 image!, P 2142792 image!, 2142793 image!, 2142794 image!, S 08-20926 image!).

*Hibbertia huegelii* (Endl.) F.Muell. var. *subvillosa* Domin, *Věstn. Král. České Společn. Nauk. Tř. Mat.-Přir.* 2: 73 (1923). *Type*: 'Northam, GREGORY X. 1900.' (*syn*: K 700375 image!, PERTH 03074927).

Spreading *shrubs* (15–)20–50(–75) cm high, resprouting from the rootstock after fire; branchlets glabrous to moderately pubescent with crisped, sometimes ±arachnoid, appressed, pale grey, simple hairs. *Leaves* widely spreading, alternate, linear to narrowly linear-obovate, (25–)30–60(–90) mm long, 1–2(–8) mm wide, the margins usually strongly revolute and completely obscuring the undersurface except the broad midrib (rarely loosely or narrowly recurved, the undersurface then largely visible); base broadly flattened and with a wide, shallow insertion on the stem, not forming a distinct petiole; adaxial surface smooth, flat to rounded with a distinct, narrow, deep groove or sulcus along the

midline, usually glabrous except near the basal margins, rarely sparsely to moderately appressed-pubescent to pilose with pale grey, simple hairs, the indumentum more dense towards the base especially along the margins where it sometimes forms a distinct fringe; abaxial surface glabrous except for the midrib which may have an indumentum as for the adaxial surface but usually sparser; apex acuminate with midrib extended as a thickened but non-pungent, straight to somewhat recurved point. *Flowers* sessile, single, terminal or terminating short shoots in upper leaf axils; primary bract narrowly ovate-triangular, 6–15 mm long, herbaceous to somewhat scarious, with indumentum as for the leaves; secondary bracts usually several (rarely absent), grading to the leaves. *Sepals* 5, ovate-acuminate (rarely ovate-acute), (10–)12–18(–24) mm long, sparsely to moderately (rarely densely) appressed-pubescent to spreading-sericeous with white, simple hairs; midribs not prominent; inner and outer sepals similar in size, apex shape and indumentum. *Petals* 5, yellow, obovate, 12–15 mm long, usually emarginate. *Stamens* (28–)30(–35), in 5 distinct bundles alternating with the carpels, each bundle with (5)6(–8) stamens, the inner one often  $\pm$ free, the remainder distinctly fused by their filaments; filaments (including fused portion) 1.2–2 mm long; anthers rectangular, 1.8–2.5 mm long, dehiscing by introrse, longitudinal slits. *Staminodes* absent. *Carpels* 5; ovaries compressed-ovoid, glabrous; styles spreading widely and excentrically from the carpel apex, 2.5–5 mm long. *Ovule* 1 per carpel. *Fruiting carpels* and seeds not seen.

*Diagnostic features.* Can be uniquely diagnosed from all other species of *Hibbertia* in Western Australia that have stamens in fused bundles around the carpels and narrow leaves with margins closely revolute to a distinct midrib, by its leaves having a distinct, narrow sulcus along the midline above, and a hard, acute-acuminate apex.

*Selected specimens examined.* WESTERN AUSTRALIA: W of Three Springs, 24 Sep. 1940, *W.E. Blackall* 4874 (PERTH); Ellis Brook Valley Reserve, 19 Sep. 1999, *H. Bowler* 619 (PERTH); Water Reserve No. 16418 adjacent to the Wongan Hills townsite, 23 Sep. 1991, *A.M. Coates* 2950 (PERTH); Maida Vale, at corner of Kalamunda Road and Midland Road, 3 Oct. 1996, *M.G. Corrick & B.A. Fuhrer* MGC 11253 (PERTH); S Eneabba Road, 15 July 1980, *R.J. Cranfield* 1477 (PERTH); 5.7 km W of Brand Highway along Shaw Road, Eneabba, 1 July 1992, *R.J. Cranfield & P.J. Spencer* 8234 (PERTH); Roberts Road, off Cockburn Road, 7 Nov. 1975, *H. Demarz* D 5831 (PERTH); 25 km c. E of York, 31 Aug. 1988, *B. Dixon* D 28/88 (PERTH); 7 km S of Eneabba, 10 July 1977, *E.A. Griffin* 887 (PERTH); along main road from Gingin to Dongara at crossing with Boothendara Creek, 15 Sep. 1971, *R.D. Hoogland* 11964 (PERTH); along Great Northern Highway, a few miles N of Pierce, at mile peg 32 from Perth, 26 Sep. 1971, *R.D. Hoogland* 12015 (PERTH); both sides of Perry Road, 0.15–0.55 km S of junction with Bell Road, Shire of Dalwallinu, 15 Sep. 1999, *J.W. Horn* 2475 (PERTH); Mission Road, 18 km NNW of Kojonup, 2 Nov. 1998, *C.M. Lewis* 387 (PERTH); SW corner of camping reserve, Bunny Road W side at 3.6 km N of Skipper Road, 10 Oct. 2002, *S. Patrick* 4502 (PERTH); near Yanchep National Park, 22 Sep. 1962, *M.E. Phillips* WA/62 912 (PERTH); 13 km NE of Yandanooka, on private land, Aug. 1998, *R. Soullier* 610 (PERTH); site ML35, N of Gngangara Road, S side of Lot 47 Lexia Avenue, locality of Ellenbrook, 1 Sep. 1999, *M. Trudgen & S. Firth* MET 20372 (PERTH); Mogumber West Road, 27.5 km by road E of Brand Highway, 3 Sep. 1984, *J.R. Wheeler* 2325 (PERTH); c. 20 km E of Piawaning, 16 Sep. 1988, *J.R. Wheeler* 2532 (PERTH).

*Phenology.* Flowers from July to November with a distinct peak in September.

*Distribution and habitat.* Widespread from the vicinity of Morawa and Mingenew south to Mundijong and east to Dalwallinu, Wongan Hills, York and Brookton, with outlying populations near Yarloop, Bunbury and Kojonup (Figure 1). *Hibbertia striata* has a substantially wider distribution than *H. huegelii*, including on the Swan Coastal Plain where *H. huegelii* is largely absent. Occurs in a wide variety of

habitats including jarrah, marri and wandoo forests and woodlands, *Banksia* woodlands, kwongan and shrublands, on sandy and loamy soils over laterite and (rarely) coastal limestones.

*Conservation status.* Common and widespread and not considered to be under threat.

*Notes.* *Hibbertia striata* differs most noticeably from *H. huegelii* in its distinctly acuminate leaves with a distinct, narrow sulcus along the midrib above, and in its larger flowers. It consistently has more stamens per bundle (6 *cf.* usually 4 or 5). The styles in *H. striata* spread widely and more or less horizontally from the apex of the carpels so that the stigmas are borne outside and below the anthers, whereas in *H. huegelii* the styles are more erect and the stigmas are borne above the anthers. When co-occurring, *H. striata* and *H. huegelii* may be readily distinguished at a distance even when not in flower by the taller habit of the former with fewer, less-branched stems and finer, paler green leaves contrasting with the lower, many-stemmed habit and shorter, broader, darker leaves of the latter.

*Hibbertia striata* flowers in late winter and early spring, with a distinct peak in September. By contrast, *H. huegelii* may flower at almost any time of the year. At a mixed population in Wandoo National Park (K.R. Thiele 5386, 5387), *H. huegelii* plants did not flower at all during the spring flowering season of *H. striata*; it is possible that *H. huegelii* requires fire to flower freely, while *H. striata* does not.

The androecium of *H. striata* is remarkably consistent. Each of the five staminal bundles usually comprises six (rarely five, or to eight) stamens. An innermost stamen is erect and has a filament that diverges from the bundle low down, sometimes at the very base. The remaining five stamens are in two groups and have very short free filaments distal to the fused portion. The outermost pair spread widely, while a middle group of three forms a linear series between the innermost stamen and the outermost pair, at right angles to the radius of the flower. The anthers of all but the innermost stamen are somewhat kinked at their insertion on the filaments. Flowers with fewer or more stamens than the usual six have the same basic pattern, but with missing or supernumerary stamens in the middle or outer positions.

The type of *H. huegelii* var. *subvillosa* has the typical dorsal sulcus and acute-acuminate leaf apex of *H. striata*. It has a denser indumentum on all its parts. Specimens with a similar indumentum are common on the inland side of the range of *H. striata*, as at Northam where the type of this name was collected.

Many specimens collected from near Eneabba and Warradarge (e.g. PERTH 02387131) have unusually broad leaves with scarcely revolute margins. Similarly broad- and flat-leaved plants of *H. hypericoides* (DC.) Benth. occur in the same area (Thiele & Cockerton 2015). These specimens are typical of *H. striata* in all other respects; further research is needed to determine if they could be recognised as a distinct taxon.

***Hibbertia huegelii*** (Endl.) F.Muell., *Fragm.* (Mueller) 11(92): 95 (1880). *Candollea huegelii* Endl., in S.F.L. Endlicher, E. Fenzl, G. Benthams & H.W. Schott, *Enum. Pl.* [Endlicher] 2 (1837); *Hibbertia huegelii* (Endl.) F.Muell. var. *subglabra* Domin, *Věstn. Král. České Společn. Nauk. Tř. Mat.-Přír.* 2: 73 (1923), *nom. illeg.* Type: 'Swan-River. (Hügel.)' (*holo*: W 46813 image!).

*Hibbertia pachyrrhiza* Steud., in J.G.C. Lehmann, *Pl. Preiss.* 1(2): 269 (1845); *Candollea pachyrrhiza* (Steud.) Benth., *Fl. Austral.* 1: 44 (1863). Type: 'In arenosis montium Darlings-range, ditionis Perth, 20. Mart. 1839. Herb. Preiss. 2149.' (*syn*: HBG 507140 image!, LD 1359197 image!, MEL 666689!, MO 279474 image!, P 682361 image!, S 08-20157 image!).

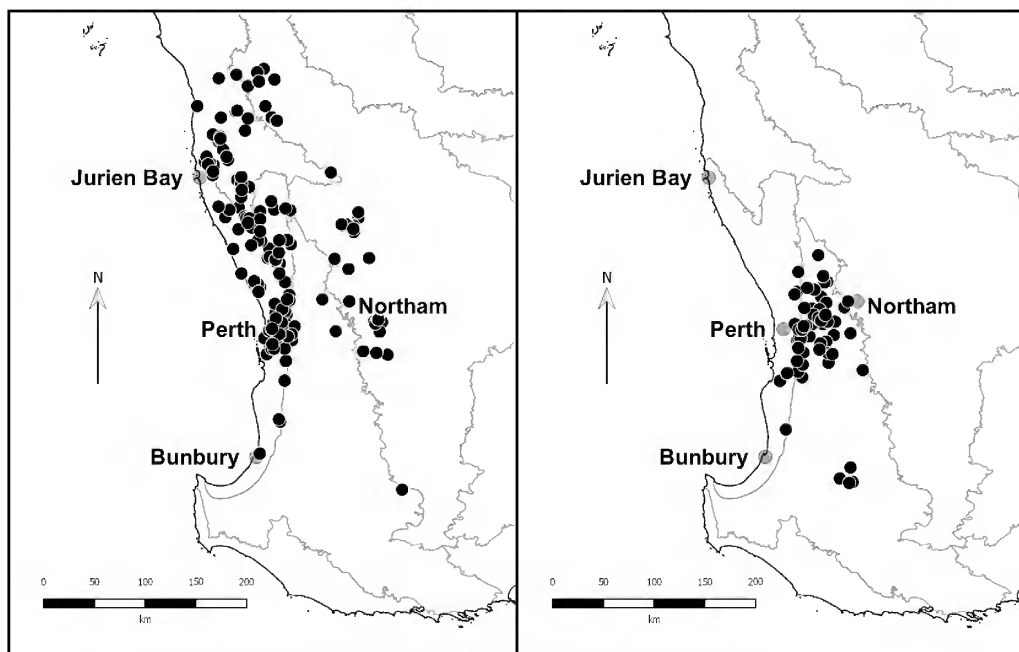


Figure 1. Distribution of *Hibbertia striata* (left) and *H. huegelii* (right) in south-western Australia.

*Hibbertia basitricha* Steud., in J.G.C. Lehmann, *Pl. Preiss.* 1(2): 268 (1845). *Type*: ‘In confragrosis ad radices jugi montium Darling’s-range, ditionis Perth, 4. Dec. 1839. Herb. Preiss. No. 2165.’ (*syn*: LD 1242793 image!, MEL 666690!, MO 279563 image!, P 2428366 image!, S 08-20001 image!).

*Candollea cygnorum* Steud., in J.G.C. Lehmann, *Pl. Preiss.* 1(2): 275 (1845). *Type*: ‘In arenosi prope cataractam ad caput fluvii Cygnorum, 26. Jul. 1839. Herb. Preiss. No. 2174.’ (*syn*: LD 1240802 image!, P 682355 image!).

Spreading *shrubs* 20–30(–50) cm high, resprouting from the rootstock after fire; branchlets sparsely to densely villous with sinuous to crisped, loosely appressed to  $\pm$ spreading, white to pale grey simple hairs. *Leaves* erect to spreading, alternate, linear to very narrowly linear-obovate, (20–)30–40(–60) mm long, (0.8–)1–1.5(–2) mm wide, the margins strongly revolute and usually completely obscuring the undersurface except the broad midrib; base broadly flattened and with a wide, shallow insertion on the stem, not forming a distinct petiole; adaxial surface smooth, evenly rounded or sometimes with a broad, shallow, indistinct groove along the midline, sparsely (rarely moderately) pilose with simple hairs as for the stems (sometimes  $\pm$ glabrescent), the indumentum usually more dense towards the base especially along the margins where it sometimes forms a distinct fringe; abaxial surface glabrous or with indumentum as for the adaxial surface but usually sparser; apex obtuse to bluntly acute, straight. *Flowers* sessile (rarely with a pedicel to 5 mm long), single, terminal or terminating short shoots in upper leaf axils; primary bract narrowly ovate-acuminate, (4–)7–10 mm long, herbaceous to somewhat scarious, in pedicellate flowers inserted at the base of the pedicel, with indumentum as for the leaves. *Sepals* 5, ovate-acuminate (rarely ovate-acute), (6–)8–10(–13) mm long, glabrous to moderately (rarely densely) appressed-sericeous with short, white,  $\pm$ appressed simple hairs; midribs not prominent; inner and outer sepals similar in size, apex shape and indumentum. *Petals* 5, yellow, obovate, 8–11 mm long, usually emarginate. *Stamens* 15–25(–34), in 5 distinct bundles alternating with the carpels, each

bundle with (3)4 or 5(–9) stamens, the inner one often  $\pm$ free, the remainder distinctly fused by their filaments; filaments (including fused portion) 1.5–2 mm long; anthers rectangular, 2–2.5 mm long, dehiscent by introrse, longitudinal slits. *Staminodes* absent. *Carpels* (3)4 or 5; ovaries compressed-ovoid, glabrous; styles excentrically curved-erect from the carpel apex, 2.5–3.5 mm long. *Ovule* 1 per carpel. *Fruiting carpels* and seeds not seen.

*Diagnostic features.* Can be uniquely diagnosed from all other species of *Hibbertia* in Western Australia that have stamens in fused bundles around the carpels and narrow leaves with margins closely revolute to a distinct midrib, by the  $\pm$ obtuse leaves lacking a distinct, narrow sulcus along the midline above, and the white to pale grey indumentum on sepals and leaves with hairs more dense towards the base and forming a  $\pm$ distinct fringe along the margins.

*Selected specimens examined.* WESTERN AUSTRALIA: N of Cooks Road near farms, 23 km ESE of Bindoon, 20 Nov. 1996, M.G. Allen 1291 (PERTH); Guildford, June 1901, C. Andrews s.n. (PERTH); 24 mile peg Albany Highway [c. 2 km S of Road Train Transfer Station on Albany Highway], 6 Nov. 1961, T.E.H. Aplin 1205 (PERTH); side of West Talbot Road, 6 Mar. 1997, R. Davis 2765 (PERTH); South Road, Mundaring, 16 Nov. 1967, J. Havel 611 (PERTH); bushland at corner of Keating and Beach Roads, Chittering, 6 Dec. 1998, M. Hislop 1266 (PERTH); along South Western Highway E of Mundijong, 13 Nov. 1974, R.D. Hoogland & G.L. Stebbins 12500 (PERTH); road to Mount Dale, near intersection with Bibbulmun Track, 23 Feb. 2000, K. Macey 63 (PERTH); Kalamunda National Park, Powerline Track between Fern Road and Bibbulmun Track, 1 Nov. 2000, K. Macey 260 (PERTH); E of Watsonia Road, Gooseberry Hill, 20 Sep. 1996, A. Markey 467 (PERTH); South Western Highway, 1.1 km N of Jarrahdale turnoff, 7 Nov. 1985, A.N. Rodd & G. Fensom ANR 4813 (PERTH); Helena Valley, 16 Oct. 1977, J. Seabrook 357 (PERTH); Norwood Reserve, Maida Vale, 3.8 km WNW of Kalamunda, 28 Oct. 2003, G. Smith 110 (PERTH); Norwood Reserve, 3.8 km WNW of Kalamunda, 16 Nov. 2009, G. Smith 230 (PERTH); Darling Range, near Walyunga National Park, c. 2 km along Copley Dale Road from Clenton Road, 28 Aug. 1984, J.R. Wheeler 2312 (PERTH).

*Phenology.* Flowers sparingly throughout the year, with a peak in spring (August–October). Field observations suggest that it may be a shy flowerer in the absence of recent fire.

*Distribution and habitat.* Occurs on the Darling Range from east of Wannamal to west of Mt Solus, with outlying populations north of Trigwell Bridge (Figure 1). Apparently absent from the Swan Coastal Plain with the exception of two records (B.J. Keighery 2412; R. Fairman 21/93) east and north-east of Mandurah. Note that this is a substantially smaller range than that of *H. striata*, and hence a considerable reduction in range from that previously considered for the species *sensu lato*. Recorded from marri, jarrah and wandoo woodlands, mostly on clay or loam soils.

*Conservation status.* Common and widespread and not considered to be under threat.

*Notes.* The type of Steudel's *H. basitricha* has leaves that are slightly more hairy towards the base than on the type of his *H. pachyrrhiza*, but is otherwise identical. Steudel's *C. cygnorum* has been regarded as of uncertain application since Bentham (1863), who did not see material, and cast doubt on its status including (based on Steudel's description) whether it belongs in Dilleniaceae. Two type sheets are known, each with a short leafy sprig with a single terminal flower. The flower on LD 1240802 is sessile, while the one on P 682355 appears to be shortly pedicellate. In both cases, the specimens are consistent with *H. huegelii*. The P sheet of *H. pachyrrhiza* (P 2142787) bears a label in Steudel's hand with the collecting number 2144, and the same collecting details (locality, date) as on the other

syntypes; LD 1359197 bears a Steudel slip with the same collecting number. This is likely to be a transcription error (from 2149) on Steudel's part since *Preiss* 2144 is a specimen of *H. argentea* Steud.

A striking feature of Steudel's *Plantae Preissianae* treatment of Dilleniaceae is that he assigned his new species to either *Candollea* (e.g. *C. striata*, *C. cygnorum*) or *Hibbertia* (e.g. *H. pachyrrhiza*, *H. basitricha*) despite the fact that all have stamens united into bundles, the diagnostic feature of *Candollea*. None of Steudel's protologues describe the androecium or gynoecium, and he appears to have largely overlooked these critical features.

*Hibbertia huegelii* may be reliably discriminated from *H. striata* by the relatively obtuse leaf apices and absence of a distinct, narrow sulcus along the midline of the adaxial leaf surface; at most, some leaves on some specimens may have a broad, shallow, indistinct groove along the midline, but this will be absent on many leaves.

*Hibbertia ferruginea* J.R. Wheeler is somewhat similar to *H. huegelii*, but has generally more acute leaves, and a distinctive ferrugineous rather than pale grey to white indumentum on the sepals. *Hibbertia huegelii* may be more closely related to *H. desmophylla* (Benth.) F. Muell. (which differs in having shorter, broader and more or less distinctly fascicled leaves) than to *H. striata*, but a detailed phylogenetic analysis is required before this can be determined.

### Acknowledgements

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